

U.S. Patent Application Serial No. USSN 09/981,440
Reply to Office Action of 3/27/2007

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REMARKS

Applicants have received and reviewed an Office Action dated March 27, 2007. By way of response, Applicants have amended claims 1, 3, 6-7, 16, and 24, and canceled claims 2, 4-5, 10-15, and 23 without prejudice. No new matter is presented. Claims 1, 3, 6-9, 16-18, 21-22, and 24 are pending. Applicants submit that the pending claims are supported by the specification.

For the reasons given below, Applicants submit that the amended and newly presented claims are in condition for allowance and notification to that effect is earnestly solicited.

35 U.S.C. § 112

Claims 1-18, 23 and 24 were rejected under 35 U.S.C. § 112, second paragraph, as indefinite. Without acquiescing to the rejection, and solely to further prosecution, Applicants have amended claim 1 to remove the basis of the rejection. Claims 7, 16-18, and 24, all of which depend from claim 1, are thereby amended.

Claims 10, 11, 15, and 23 have been canceled without prejudice, removing the additional bases of rejection of those claims.

Accordingly, Applicants respectfully submit that the amended claims fully comply 35 U.S.C. § 112, second paragraph, and withdrawal of this rejection is respectfully requested.

35 U.S.C. § 103(a)

- a) Claims 1, 2, 10-18, 23 and 24 were rejected under 35 U.S.C. § 103(a) over Zou et al., US 6,762,049, in view of Austin et al., US 6,203,683, and further in view of Laugharn, Jr. et al., US 6,719,449. Claims 2, 10-15, and 23 have been cancelled rendering the rejection of these claims moot. Applicants traverse the rejection with respect to claims 1, 16-18, and 24.
- b) Claims 6-9 were rejected under 35 U.S.C. § 103(a) over Zou et al., US 6,762,049, in view of Austin et al., US 6,203,683, and Laugharn, Jr. et al., US 6,719,449, as applied to claim 2, and further in view of Miyazaki et al., US 5,599,502. Applicants traverse the rejection.
- c) Claims 3-5 were rejected under 35 U.S.C. § 103(a) over Zou et al., US 6,762,049, in view of Austin et al., US 6,203,683, and Laugharn, Jr. et al., US 6,719,449, as applied to claim 2, and further in view of Miyazaki et al., US 5,599,502, and Scott, US 5,594,751. Applicant has

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cancelled claims 4-5 rendering the rejection of these claims moot. Applicants traverse the rejection with regard to claim 3.

Applicants' claimed subject matter contemplates an optical system for heating, measuring concentration of a desired material, and measuring temperature, wherein the optical measurements are taken through the clear portions of the cartridge. In embodiments, using a vertical cavity surface emitting laser (VCSEL) light source, direct and accurate measurements of concentration are possible. None of the prior art references discloses a clear reaction container, that is lightweight and disposable, and that allows infrared heating and measurement of transmitted radiation for accurate optical measurement of both temperature and concentration using one device. Thus, the prior art references do not teach all the elements of Applicants' claimed subject matter. The claimed subject matter provides an inexpensive, efficient, and accurate means of heating, measuring concentration, and regulating temperature, which in turn allows for better control of temperature.

Zou et al is directed to a chip with an array of reaction chambers pressed against a substrate having heating blocks to heat the reaction chambers. The disclosure of Zou et al. is not even close to Applicants' invention. As conceded by the Examiner, Zou does not disclose an infrared heat source, an optical temperature sensor, instrument to measure electromagnetic emissions, or a feed back loop configured to provide measured temperatures to the controller, and to modulate the power supply to drive the infrared light heat sources to achieve a desired temperature with a smooth control curve at the desired temperature. Zou et al. does not teach or suggest anything resembling Applicants' invention.

Austin et al, describes a device with a totally different structure and mechanism of operation than that described by Zou et al and by Applicants. The features of Austin et al. further do not remedy the deficiencies of Zou et al. The device of Austin involves a microchip which contains electrodes for dielectrophoresis and trapping electrode that can be heated to specific temperatures. The trapping electrode is a platinum wire which can traverse several reaction chambers. In the preferred embodiment, the heating of the reaction chambers is achieved by running current through the platinum wire. Although infrared heating is identified as another heat source, this reference only discloses heating the entire sample chamber and does not provide for control of heating of individual reaction chambers. Variation in temperature for different reaction chambers are not contemplated by Austin et al. Austin does not disclose a

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cartridge with an array of temperature controlled zones, an array of infra red heat source positioned to correspond to the array of temperature controlled zones, an optical temperature monitor, a feed back loop configured to provide measured temperatures to the controller, and to modulate the power supply to drive the infrared light heat sources to achieve a desired temperature with a smooth control curve at the desired temperature, or an instrument that measures electromagnetic emissions.

Laugharn et al. does not disclose all of the elements of Applicants claims either alone or in combination with the other cited references. Laugharn et al is concerned with an apparatus that has a different structure and mechanism of operation from Austin, Zou, and Applicants. The device of Laugharn is used to treat a sample by selectively controlling sonic energy. The apparatus of Laugharn has microtiter plate that sits in a water bath in a chamber that has an acoustically transparent window and piezoelectric dome to focus the acoustic wave on a reaction chamber in the microtiter plate. It is unclear whether the apparatus would function in the absence of the water bath. In addition, since the water bath is heated by the application of the ultrasonic energy and is contact with the entire plate it is unclear whether it is possible for the microtiter plate as described in Laugharn to have an array of temperature controlled zones, although the focused ultrasonic energy can be used to heat a reaction chamber. This reference does not disclose a cartridge with an array of temperature controlled zones, an array of infra red heat sources positioned to correspond to the array of temperature controlled zones or a feed back loop configured to provide measured temperatures to the controller, and to modulate the power supply to drive the infrared light heat sources to achieve a desired temperature with a smooth control curve at the desired temperature.

Even when the references are combined they do not disclose all of the elements of Applicants claims. None of the cited reference disclose an array of infra red heat sources positioned to correspond to the array of temperature controlled zones and a feed back loop configured to provide measured temperatures to the controller, and to modulate the power supply to drive the infrared light heat sources to achieve a desired temperature with a smooth control curve at the desired temperature. Thus applicants submit that the references do not establish a *prima facie* case of obviousness.

Moreover, there would be no motivation to combine portions of the devices in the cited references with one another. As discussed above, each of these references describes devices with

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very different structures and mechanisms of operation. Thus, applicants submit that one of skill in the art would not predictably know which elements from which of the devices could be combined with one another to achieve a device that can both selectively heat and measure the concentration of reactants as claimed by Applicants.

For claim 6-9, the examiner further cites Miyazaki as further evidence of obviousness. Applicants incorporate the arguments above with respect to Zou, Austin, and Laugharn. The Miyazaki reference does not remedy the deficiencies of the other cited references. Miyazaki is directed to providing a flow of liquid sample by heating the liquid sample at the outlet to gasify it and to thereby continue the flow of the liquid to the outlet. The liquid sample at the outlet can be heated with an infrared device. However, the application of the infrared energy in Miyazaki et al is not on the reactants but at the outlet of the sample after the reaction in order to destroy the liquid sample. Thus, there is no teaching or suggestion in this reference to use infrared heat source to heat reactants in a temperature controlled zone.

With respect to claim 3, further, there is no suggestion in any of the references to use a lightweight, disposable material in conjunction with a VCSEL laser in such an optical heating and measuring system. Disclosure of the VCSEL light source itself by Scott et al. does not constitute such a disclosure; nor does the disclosure of Scott et al. suggest that the laser can be used both to heat and to provide a signal to detect temperature when passed through a sample and further through a clear plastic vessel. None of the remaining references teach the use of a VCSEL light source for either heating or measuring concentration. Thus, it cannot be said that the prior art references suggest Applicants' invention as described in amended claim 1 to one of skill in the art.

Additionally, there is no reasonable expectation of success in providing a VCSEL light source to both heat a sample and provide an accurate signal for measuring temperature in the vessel through which the laser emits radiation. While Laugharn Jr. et al. discloses optically measuring a range of properties of a sample solution, these optical properties are recited to include

"apparent color, emission, absorption, fluorescence, phosphorescence, scattering, particle size, laser/Doppler fluid and particle velocities, and effective viscosity
...Any sensed property or combination thereof can serve as input into a control system."

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Column 4, lines 1-7. This disclosure of optical measurements describes measurements that are well known to those of skill in the art. The disclosure of traditional optical measurements of physical properties cannot be said to provide any reasonable expectation that measuring the infrared radiation from a VCSEL light source, transmitted through a sample and the clear or translucent reaction chamber, would be an accurate accounting of the concentration of a material inside the reaction chamber. Thus, there could further be no expectation of success in using a VCSEL light source to provide an accurate signal.

Finally, Applicants note that it is a well accepted tenet of patent law that the references must be considered as a whole and must suggest the desirability and thus the obviousness of making the combination. *Hodosh v. Block Drug Co., Inc.*, 786 F.2d 1136, 1143 n.5 (Fed. Cir. 1986). With regard this principle, the MPEP states at section 2144.08:

"In making an obviousness determination, Office personnel should consider the number of variables which must be selected or modified, and the nature and significance of the differences between the prior art and the claimed invention."

Citing *In re Jones*, 958 F.2d 347, (Fed. Cir. 1992). Applicants submit that, in considering the references as a whole and the number of variables that had to be picked from among four different references in order to reach Applicants' apparatus, the rejection for obviousness of claim 1 as amended should not stand. Applicants summarized the disclosures of Zou et al., Laughharn, Jr. et al., Austin et al., Miyazaki et al. and Scott et al. that were acknowledged by the Examiner in the Office Action dated March 27, 2007. The summaries show that the subject matter, as a whole, does not point to the apparatus of amended claim 1. Specifically, the combined references do not suggest the desirability of making an apparatus having a clear reaction container, that provides fast, efficient infrared heating with an infrared light source, along with measurement of transmitted radiation for accurate optical measurement of both temperature and concentration using one device.

Based on the foregoing, applicants request withdrawal of the rejection.

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Summary

In view of the above amendments and remarks, Applicant respectfully requests a Notice of Allowance. If the Examiner believes a telephone conference would advance the prosecution of this application, the Examiner is invited to telephone the undersigned at the below-listed telephone number.

Respectfully submitted,

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